Integrated Water Quality and Aquatic Communities Protocol – Lakes and Ponds

Standard Operating Procedure (SOP) #7: Fish Collection and Processing

Draft Version 1.0

Revision History Log:

Previous Version	Revision Date	Author	Changes Made	Reason for Change	New Version

This SOP explains the process for collecting fish and how to process collected specimens. The deployment of a gill net is a necessary step in determining the presence/absence and composition of the fish assemblage.

Without sampling a habitat, determination of fish absence (as opposed to presence) is impossible; therefore, in all but the shallowest of habitats, the crews must deploy the gill net and it should be deployed for a minimum of 2 hours (**note: in extreme cases of many, many fish [>20], the Crew Leader can make the determination to pull the net in sooner**). If there are no fish collected in the 2 hour period, fish are recorded as "not detected." The minimum depth required for deploying the gill net is approximately 1 m, but if the habitat bottom is comprised of abundant felled trees or vegetation that would otherwise tangle the net, the Crew Leader can make a judgment call to not deploy the net. If the gill net is not deployed, the crew must be constantly aware for fish signs during the course of the sampling. If no fish or fish signs are observed in this time period, a general note should be made that no fish or fish signs were observed. However, this should not be taken to mean that fish are absent in this habitat.

Deployment of gill nets, associated with time deployed, will be used to determine "catch per unit effort," which is a measure of relative abundance. Because catch rate is dependent upon the mesh size (smaller mesh entraps smaller fish; larger mesh entraps larger fish), monitoring for trends requires that gill net specifications be kept constant throughout monitoring. We have elected to use a monofilament, variable mesh size gill net configuration used by the USGS (R. Hoffman, personal communication): Total length of 42 m, 3 panels: 1) 25mm mesh X 6 m length; 2) 35 mm X 12 m length; and 3) 50 mm X 24 m length.

Note of Caution

The public perception of gill netting for fish is a delicate situation. Crew members should strive to maintain a low profile during gill netting procedures but should be quick to stress the scientific importance of monitoring fish populations in our national parks when there are public inquiries.

Likewise, the crew members should be quick to share their findings with the public while gill netting. For instance, anglers might be interested to know what species and size are present. Crew members should also note that they are monitoring fish populations and not trying to eliminate the fish from the lake.

Gill Net Deployment

To prepare for deployment, the crew needs to ready the inflatable raft, inflatable life jacket, and the gill net. To ready the gill net, a 250 mL HDPE Nalgene bottle should be partially filled with lake water. The end line at the top of the gill net should be wrapped within the threads of the bottle, so that when the lid is tightened, the end line is secured to the partially filled bottle. This serves as a rudimentary float for the gill net. A mesh bag with several rocks (weighing approximately 1 kg) should be secured with flagging or similar cord to the bottom leadline at the end of the gill net. The rocks serve as a rudimentary anchor. With a suitable site chosen, the crew is ready to deploy the net.

1. To deploy the gill net, the onshore crew member holds the majority of the net, while the other crew member (holding the float/anchor end) rows the inflatable boat toward the center of the lake.

2. When the entire length of the gill net is pulled from shore to the center of the site, the float and anchor end of the net is released and the net is allowed to sink to the bottom of the lake. While feeding the net out, care and time should be taken to ensure that there are no tangles that may interfere with the capture of fish. The net should be deployed in as straight line a line as possible, perpendicular to shoreline. If the size of the lake prevents full deployment of the gill net, the actual deployed length should be noted and recorded. In lakes with large amounts of coarse woody debris on the bottom, the gill net can be allowed to float rather than sink (i.e., do not use the anchor bag). This will decrease the likelihood of net snagging.

3. The crew member on shore secures the shore end of the gill net to vegetation or a rock cairn at the immediate water-land interface. The shore end of the net is positioned at the water-land interface to reduce incidental capture of birds, mammals or other wildlife.

4. The time that the net was first fully deployed should be recorded on the data sheet.

Gill Net Removal and Fish Processing

1. After a minimum of 2 hours of deployment (the crews should have completed SOPs #6, 7, 9, 10, 11, and 12 in this time), the net can be retrieved for fish processing. Note that deployment can be longer than 2 hours.

2. The time that net retrieval is begun should be recorded on the data sheet.

3. The crew member in the inflatable boat paddles out to the end of the gill net. Because the net should be sunk, the crew member must grab the net in a shallow portion of the lake

and maintain a hold on the net while moving to the end of the net. The easiest way to accomplish this is to use the net to pull the raft out to the end (but the oars should still be in the boat in case the net gets away or if the wind is heavy).

4. Once the crew member is at the end of the net, he or she should lift it out of the water so that it does not snag on the bottom as the net is taken in. The crew member **on the shore** should pull the net in, weaving the retaining spine in and out of the float line bobs. This will result in a manageable, orderly net ready for disinfection and redeployment at the next lake.

5. While the net is being retrieved, the crew member on the shore is responsible for removing large particles of detritus or woody debris from the net. Removal of woody debris can be a time consuming process; rushing the removal of a twig may cause damage to the gill net. Crews should minimize the amount of damage done to the gill net during the retrieval and cleaning process.

6. As the net is retrieved, fish should be removed. Care is taken to prevent damage or undue pain to fish upon removal. In general, there are two methods to remove the fish from the nets: 1) Push the fish forward through the mesh, assisting the movement of the monofilament around the gills and abdomen. This will be the easiest if the fish is small relative to the size of the mesh. 2) Back the fish out of the mesh. This is more time consuming, but maybe the only option if the fish is large relative to the mesh size. Take care to minimize damage to the fish as the monofilament lines will become entrapped beneath the gill opercula unless great care is taken during fish removal.

7. Collected fish should be placed in a collapsible bucket filled with water. If many fish are caught, multiple buckets may be necessary.

8. After all fish are removed and the gill net is completely retrieved with float bottle and anchor bag removed, the net should be laid (still bundled up) someplace in ample sunlight (if available) so that it can dry thoroughly, and be disinfected according to SOP # 12: Post-Site Tasks.

Fish Processing

Processing of fish should be completed as quickly as possible after fish capture. Four key measurements are made: 1) Species ID; 2) Fork Length and Total Length; 3) Weight; and 4) Indication of Disease. Species determination should be made using fish guides (an example is provided in Appendix H). Specimens that are unidentifiable or questionable (e.g., a fish species that does not match the descriptions in the guide) should be retained as voucher specimens for further study. Vouchered specimens should be placed in doubled Ziploc bags containing 70% ethanol. A paper label (in pencil on weather resistant paper) indicating location, date, and collector should be inserted into the doubled Ziploc bags. Vouchers will be transferred to a large 2 L Nalgene vial at the housing facilities.

Fork length (FL) is the length measured from the tip of the snout to the middle of the caudal fin (see Figure 1). A fish board should be used to determine FL by placing the snout against the

backboard and measuring the point where the caudal fin is shortest (i.e., the middle). Total Length (TL) is measured from the snout to the longest measurement, when the tail is condensed (e.g., not splayed out).

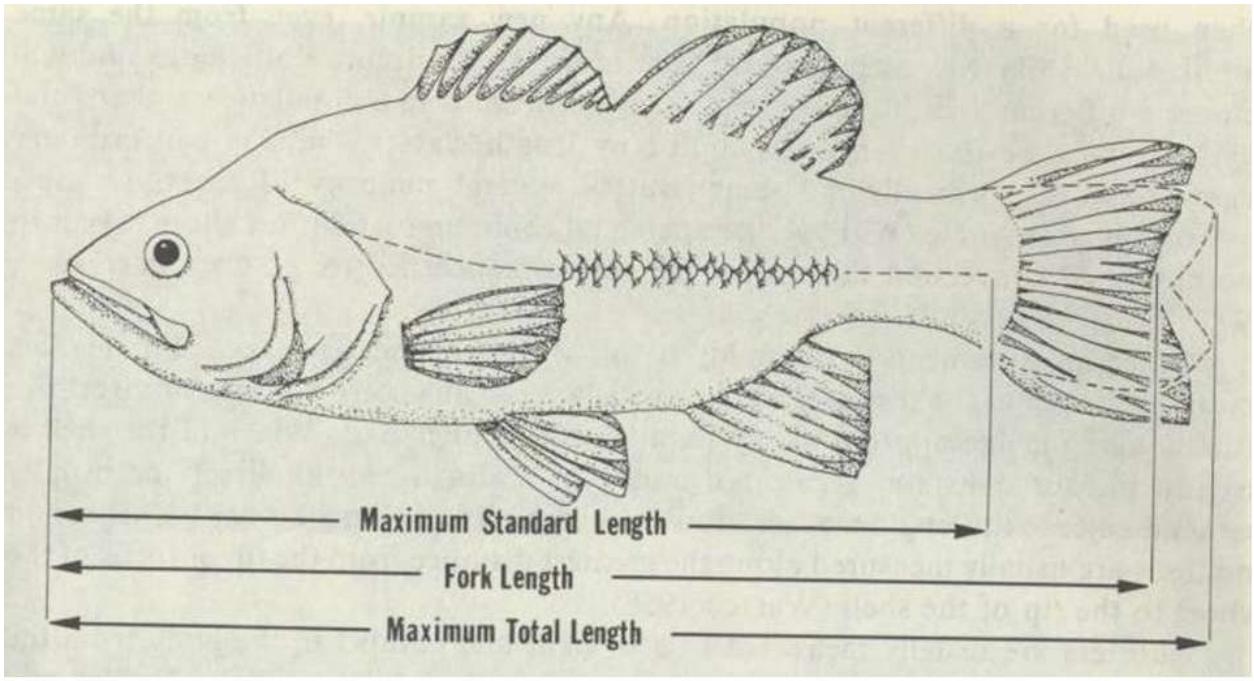

Figure 1. Common length measurements of fish. Maximum Standard Length is measured from the snout to the base of the caudal peduncle. From Gutreuter and Anderson, 1983.

Weight is determined using a pesola scale. To weigh a fish, place the fish in an appropriate sized Ziploc bag, and clip the scale to the bag. Record the weight (note that the Ziploc bag weight can be considered negligible for fish weight). There are two scales available for weighing; crew members should use the one most suitable for the particular fish.

Fish should also be inspected for external anomalies or disease (see Figure 2 for examples). The type of anomaly, location, and severity should be scored on the data sheet following the guidelines in Table 1, adapted from Ohio EPA (1989). Other signs of diseases should be noted as observed (see Figure 3 and Table 2).

All data should be entered and recorded into the appropriate field data sheet (Appendix F).

At the discretion of the crew leader, viable fish should be returned to the lake from which they were captured. Fish that are identified as nuisance exotic species should be euthanized, while exotic sport fish should be returned. Native fish should be returned if viable and with strong signs of life (e.g., responsive to stimuli, active swimming). If an individual is lethargic and unresponsive, the fish should be euthanized. The requirements of the permit issued by the parks should also be consulted as to how nuisance exotic fish should be disposed of.

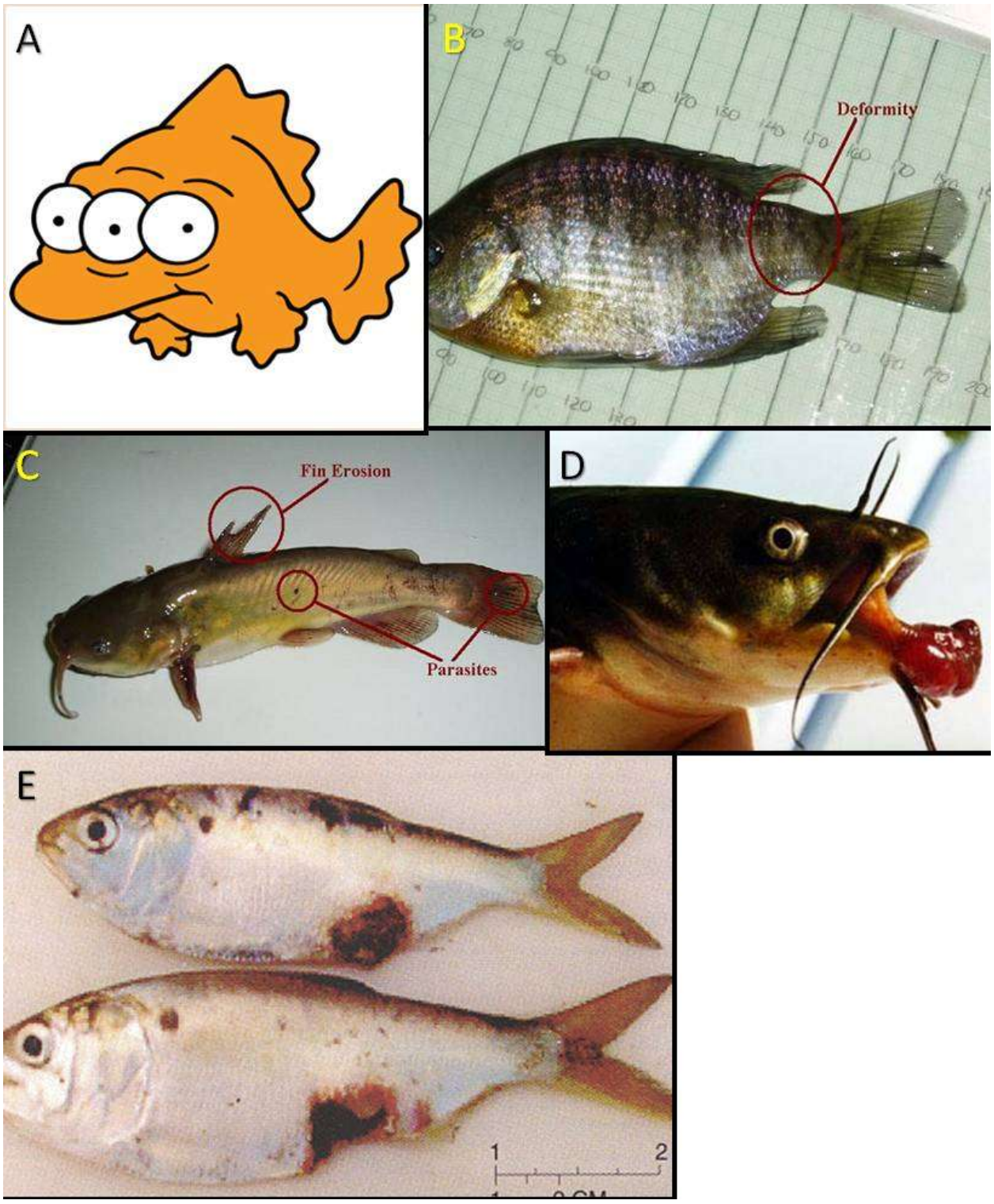

Figure 2. Examples of fish deformities, eroded fins, lesions, and tumors: A. Goldfish from Springfield Lake, Tri-state area (fish caught by H. Simpson); B. Bluegill showing tail deformity; C. Bullhead showing fin erosion and parasites (Images B and C from US Fish and Wildlife Service; D. Unidentified catfish showing tumor (from National Oceanic Atmospheric Administration); E. Menhaden showing lesions (from United States Geological Service).

Table 1. Deformities, eroded body parts, lesion, and tumor (referred to as "DELT") scoring guidance; adapted from Ohio EPA (1989).

	Severity Grade	
Type of Anomaly	**Mild**	**Severe**
Deformity (fin, head, vertebrate, other body part)	1 deformity	>1 deformity
Eroded body part (fin, gill opercula, etc.)	<2 eroded body parts, or fins not eroded past ray fork	≥3 eroded body parts, or fin eroded to base
Lesion (open sore, exposed tissue, ulcer)	<2 lesions < the size of the largest scale	≥3 lesions, or a lesion > the size of the largest scale, or raw tissue
Tumor	<2 tumors < the diameter of the eye	≥3 tumors, or 1 tumor larger than the diameter of the eye

Table 2. Other diseases that should be noted on field forms as identified (adapted from Ohio EPA 1998).

Other diseases	**Description**
Anchor worm	A parasitic copepod, appearing as a slender, worm like body with head attached in fish flesh.
Black spot	A trematode parasite that appears as small, black cysts on skin and fins.
Leeches	Hirudinea, generally identifiable by the presence of two suckers, ability to contract or elongate.
Fungus	Appears as white cottony growth.
Ichthyophthirius multifiliis	A protozoan that appears as a white spotting.
Popeye	Bulging eyes; this can be caused by one of several factors.
Whirling disease	Caused by *Myxobolus cerebralis,* causing spinal, head, and jaw deformities and black tails.

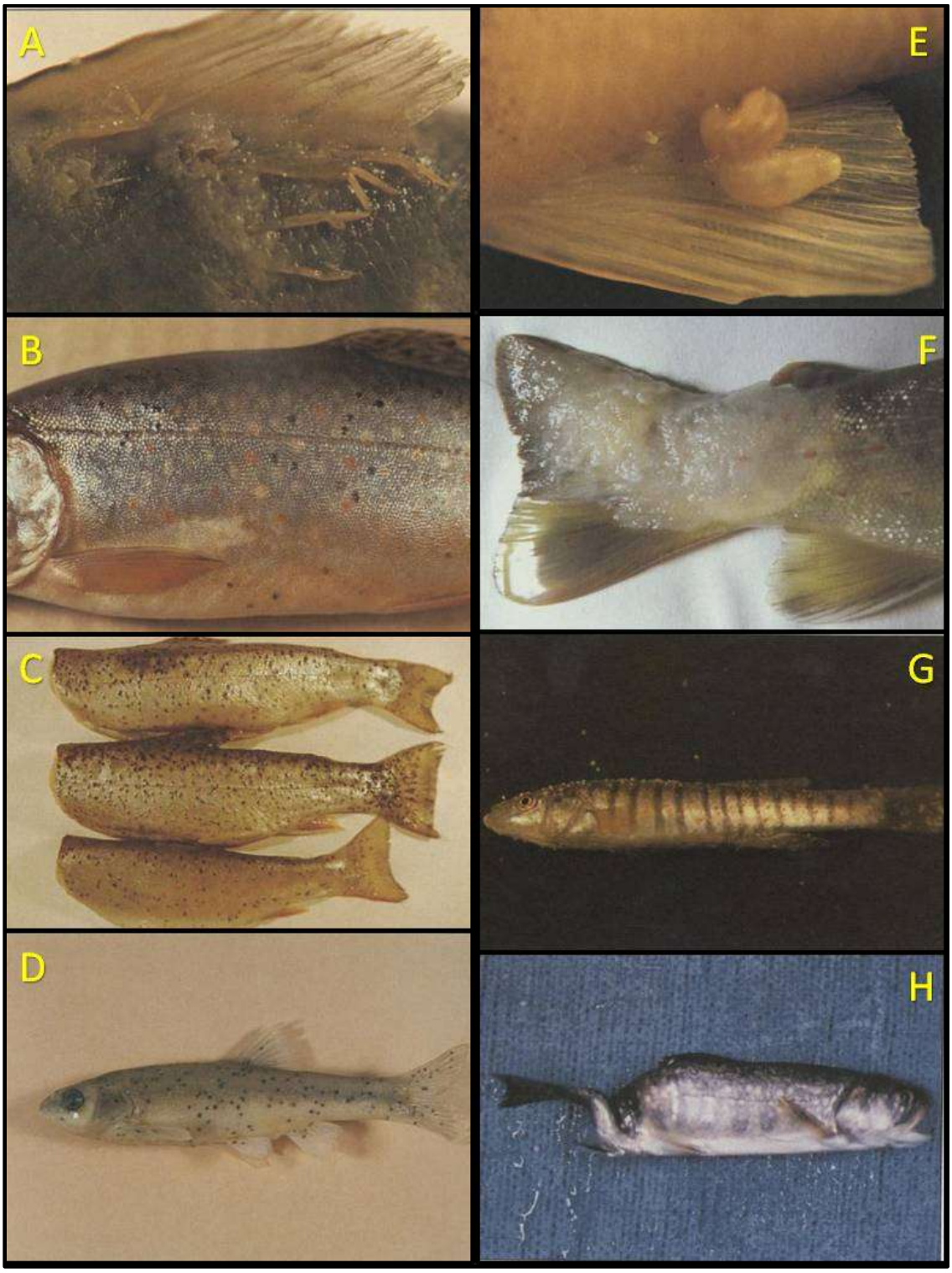

Figure 3. Examples of external fish disease: A. Anchor worms infecting rainbow trout; B. Blackspot disease on brook trout; C. Severe blackspot disease on brook trout; D. Blackspot disease on flathead chub; E. *Myzobdella* leech on fin of yellow perch; F. Fungus growing on fin and peduncle of brown trout; G. *Ichthyophthirius multifiliis* infection on plains killifish; H. Whirling disease (*Myxobolus*) in brook trout. All images from Mitchum (1995).

During euthanasia procedures, public attitudes should be considered. The techniques presented here should be carried out as humanely as possible. The American Society of Ichthyology and Herpetology (ASIH, 2003; Appendix K for amphibians) lists the techniques of pithing, spinal cord dislocation, or decapitation as acceptable forms of euthanasia. Pithing is the insertion of a sharp object (probe or knife blade) into the brain cavity of the animal, followed by a rapid twisting and scrambling. Spinal cord dislocation, or breaking the neck of an organism is accomplishable by a sharp impact to the animal's head. Swift decapitation with a sharp blade has also shown to be humane and quickly result in mortality. Because pithing involves the insertion of a sharp object into an organism that is difficult to hold onto, and because spinal cord dislocation may be unaesthetic to the public, the preferred method for euthanasia is decapitation. However, because fish species can be tolerant to low oxygen levels, decapitation should also be followed by pithing the brain cavity. The Project Lead will insure that all crew members are trained in euthanasia techniques.

Several methods are acceptable for fish carcass disposal: 1) Burying carcasses in a hole a minimum of 200 m from a water body as deep as possible; 2) Sinking carcasses in the deepest part of the lake by puncturing the swim bladder (likely done during decapitation); and 3) Transporting carcasses secured in plastic bags and disposing in a landfill.

Literature Cited

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